

Spring home range and social behavior of Hazel grouse at Changbai Mountain¹

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Abstract The spring home range and social behavior of Hazel grouse (*Bonasa bonasia*) were studied at Changbai Mountain using radiotelemetry in 1993~94. Flock dissolution and pair formation started in mid-March. Paired males held territories in spring, the area was from 3.2 hm² to 17.3 hm² (n=2). Hazel grouse was proved to be monogamous by radiotelemetry work. The overlap of home range between paired No.10 and No.8 was 82.4%. The time of birds being together was 83.0% of the time during the prelaying period (n=53), showing that the pair bond was stable. Unpaired males showed different behavior, held a territory or wandering, and they changed their behavior in early May. The study suggested that unpaired males gave up their reproduction goal, and the acquisition for survival became more important in early May, when female started incubation.

Key words: Hazel grouse, Spring home range, Social behavior, Changbai Mountain

Introduction

The Hazel grouse (*Bonasa bonasia*) is widely distributed in the forest of north Eurasia. In China, it is mainly distributed in Changbai Mountain, northeast of Daxing'an Mountains and Xiaoxing'an Mountains, and at Altai Mountain in Xinjiang Province. Previous studies on the Hazel Rouse in China was based only on interrupted field observations and captive breeding (Zhao Zhengjie 1977; Zhu Zuobin et al. 1988; Gao Wei and Zhu Zuobin 1991). During 1993~1994, radiotelemetry was used on the study of Hazel grouse in Changbai Mountain. Here we presented the results on the home range and social behavior of Hazel grouse in early reproduction period.

Methods

The study was conducted on the northern slope of the Changbai Mountain in northeastern China (45°N, 130°E). The annual mean temperature is 3.3°C, and the annual precipitation is 672mm. At an altitude about 700~800m, the main forest type was an old deciduous-conifer mixed forest. The dominant conifer was Korean pine (*Pinus koraienses*), and predominant deciduous trees were maples (*Acer* sp.), Manchurian ash (*Fraxinus mandshurica*), limes (*Tilia* sp.), Japanese elm (*Ulmus propinqua*) and David's poplar (*Populus davidiana*). Second-growth forest (50-year-old) dominated by Asian white birch (*Betula platyphylla*) and David's poplar occurred along the forest roads.

The study covered two breeding seasons in 1993 and 1994, based on the results from 10 radio-tracked birds. The Hazel grouse was captured in spring by traps and nets

(Sun Yueha & Fang Yun 1994). Each was fitted with a necklace-type transmitter (Kenward 1987) that weighed about 12 g (3%~3.8% of the bird's weight). Radio-tracked birds were located 1~3 times per day in 1993 and mostly 2~4 times per day in 1994. The home range size for a specified period was delineated using the minimum convex polygon method based on more than 25 locations.

A pair was considered to be a social unit when a male and a female were seen together, or they were located within 25m. At Changbai Mountain, incubation began on May 4, 1994 (n=2) on the average. The mean laying interval period between eggs of Hazel grouse is about 1.3 days (Pynnonen 1954; Semenov-Tyan-Shanskii 1959; Gao Wei & Zhu Zuobin 1991), and the mean clutch-size on the area was 10.38 (Piao Zhengji & Sun Yueha 1997). No information on the duration of fertility following copulation is available, but it averaged 8 days in Willow Ptarmigan (*Lagopus lagopus*) (Parker 1981). According to this, we assumed the prelaying receptive period began on April 14.

Results

Hazel grouse formed flocks in winter, at Changbai Mountain. Flock dissolution and pair formation started in mid-March. Males called as "ji-jijiji", mostly in the morning, it was believed to be a function of marking their territories and attract females. Female also called. When a pair was disturbed, both birds called and approached to reunite (n=5). When we tried to capture the Hazel grouse by nets, a captive female was used as decoy. Males were attracted by whistles, when they saw our decoy, and approached to it, they walked outside the cage, sometimes even flew at the top of decoy's cage (n=3).

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Paired males held territories in spring from 3.2 hm^2 to 17.3 hm^2 ($n=2$). The home range of two unpaired males in April was 2.13 hm^2 (No.12) and 31.3 hm^2 (No.6).

The home range of 3 neighboring radioed males (No.6, No.10 and No.12) and one female (No.8) in April 1994 was shown on Fig.1. The overlap area between No.10 and No.12 was only 3.7% of that of No.10's home range. No.12 was observed in pair in early April, but his female was killed on April 7. No.12 still held his territory, only seldom left for long walks ($n=1$). No.12 was not seen to be in pair again. No.6 was an unpaired male, his home range size was 31.3 hm^2 , much larger than that of other males, his home range was also overlapped much comparing with No.10 (20%) and No.12 (24%). As locations of No.6 were 33 in April, No.10's and No.12's territories were 8 and 9 respectively; other 16 might also located in the territories of unradioed males.

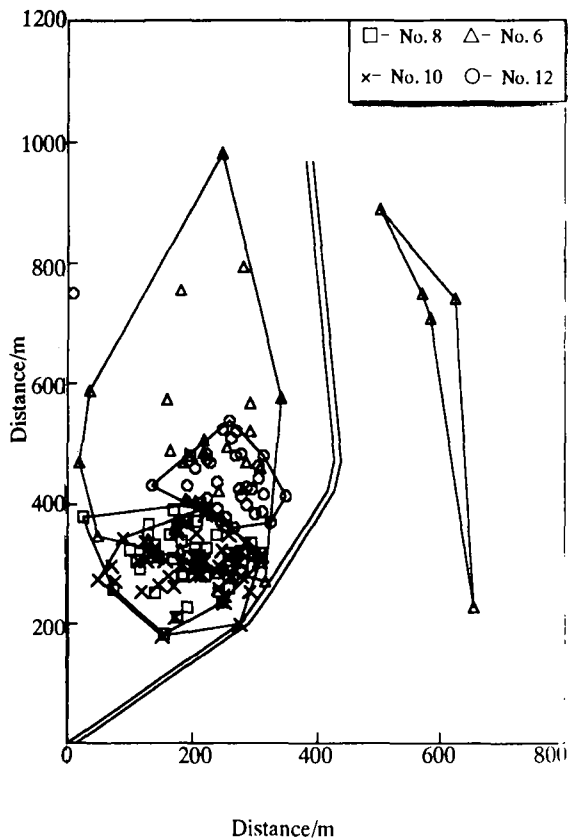


Fig. 1. Home range of 4 neighbouring radioed Hazel grouse (No. 8, 6, 10, 12) in April 1994

The overlap of home range between paired No.10 and No.8 was 82.4%. The time of No.10 and No.8 being together was 83.0% of the time during the prelaying period ($n=53$, April 2 to May 4). However, during prelaying receptive period, they were together 72.7% of the time ($n=44$). One radioed female No.5 was seen in pair on

March 24, 1994 in the second-growth forest, but moved at least about 4~5km into the virgin forest on April 5, and at last lost. As her paired male was not radioed, we did not know if it moved with her. However, from other radioed males, we found that males did not move far. No.5 might leave her male in second-growth forest, and pair with another male in the virgin forest.

Female No. 8 started incubation on May 4th at the edge of No.10's territory. No.10 stayed in his territory, the distance between No.10 and the incubating female No.8 was 82.6 ± 45.0 m ($n=15$), with the farthest of 155m and least of 19m. Paired male No.7 also showed this behavior. Its home range in May was 86.6% overlapped of that in April (Fig. 2), suggesting that paired males would stay in their territories during incubation period.

Two unpaired males of No.12 and No. 6 left their April's home range in early May. On May 4, No.12 moved 270 m northward from his April home range, crossed the forest road, and stayed in a patch of second-growth forest. During May 15~18, he moved again and settled down (Fig. 3). On May 3, No.6 stopped wandering and stayed at an area of dense second-growth forest of 0.82 hm^2 for 10 days. Then he moved northward for 400 m and settled down at a range of 1.16 hm^2 (Fig. 4).

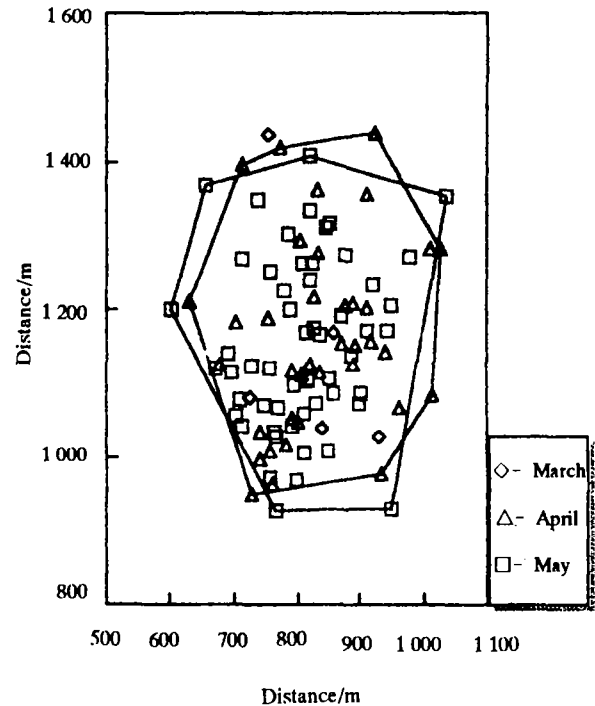


Fig. 2. Home range of paired male (No. 7) in April and May

Females were reported to hold territories in spring (Swenson & Boag 1993). However, we did not observe female's fighting. As we did not radio-track neighboring females, we could not discuss female's territoriality.

In the past, Hazel grouse was thought to be monogamous in China from observations of unmarked birds (Gao Wei & Zhu 1991). Our radiotelemetry study proved that Hazel grouse was monogamous. The pair was the social

unit. Swenson & Boag (1993) also reported the social organization of Hazel grouse was monogamous by their radiotelemetry work, but the pair bond in that population appeared to be relatively weak. The time of members of pairs being together was only 37% of the time during the prelaying period. According to the radioed pair of this study, the pair bond seemed to be more stable at Changbai Mountain. Members of pair were together 83% of the time together during the whole prelaying period. A female might moved more than 4~5km from her partner in early April. We thought it might not be so stable for all the pairs before the receptive period.

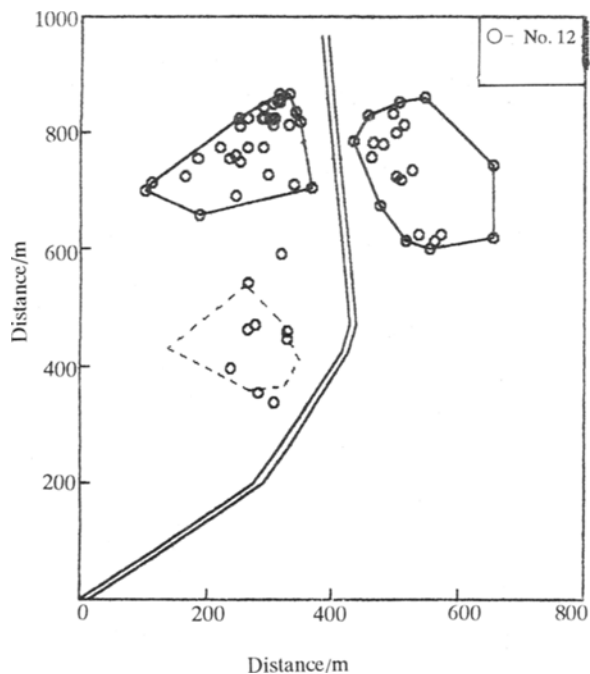


Fig.3. Home range of unpaired male (No. 12) in May 1994

Unpaired males showed much difference in behavior. Swenson & Boag (1993) suggested the males without a female: (1) They stayed in their territory, but used twice as much space as males with a female. (2) They left their territories, moved to 2.1~14.3 km, when females stopped changing territories. (3) They moved into a neighboring male's territory to share the female. Our No.12 was similar to case (1), only did not use more space; No. 6 was similar to case (3), but it wandered and moved into several males' territories, seeking for mating with potential females.

Zhou Fuzhang et al. (1964) reported that males looked after the incubating females, but Zhao Zhengjie (1977) did not observe this behavior at Changbai Mountain. Our results suggested that paired males stayed in their territories during the incubation period. And the distance between the male to the incubating female was (82.6 ± 45.0) m, and 19 m at least. The male might be able to help the female at this distance. But we did not get any evidence of such help

during our study. In 1993, one incubating female lost much her tail feathers during a fighting with an enemy (Sun Yueha, unpublished data). The fighting, which we did not observe, might be fierce, but we did not found any male's feather on the spot, her paired male might not put in the fight.

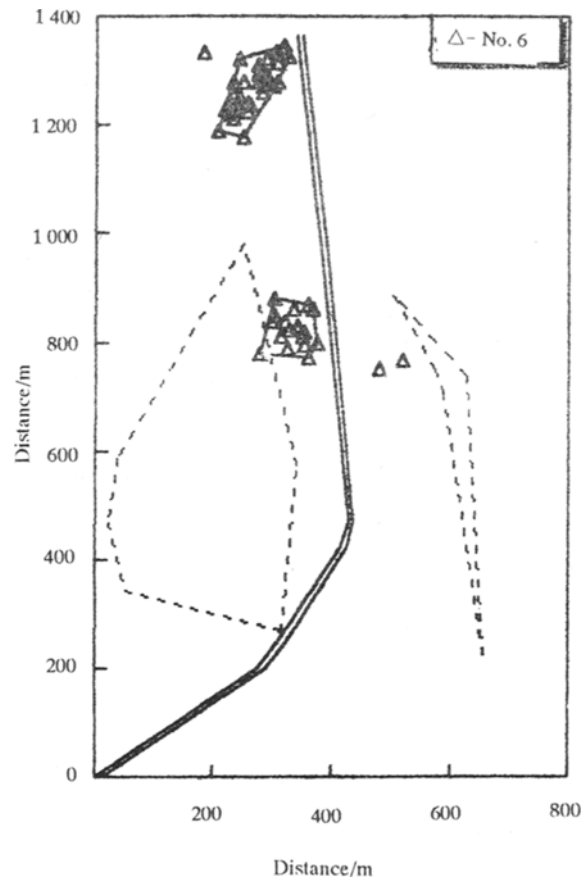


Fig. 4. Home range of unpaired male (No. 6) in May 1994

Discussion

Territorial behavior was generally employed by individuals in the acquisition of goals which tended to maximize individual survival and reproduction (Brown 1964). We thought that the individuals would trade-off these two acquisitions of goals. In early May, the females started incubation; the chance for unpaired males to mate with a female by occupying a territory would be much less. For unpaired males, no matter seeking for a female by defending a territory (No.12), or by wandering (No.6), both were energy consumed. The birds had spent much energy in March and April. We suggested that unpaired males gave up their reproduction goal and the acquisition for survival became more important in early May, when female started incubation.

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